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Abbreviated Panel Summaries

Mr. Dumont presented the following summary information from each panel co-moderator:

Panel 1: Safety, Health, and Economic Impacts of Weather and Climate in the Urban Environment

- (1) Lead times for tropical cyclones need to be increased and improved (lead times in general).
- (2) We need to look at urban meteorology from a total system approach. By doing this we should be able to figure out a cost-benefit ratio showing which part or parts of the system provide the best benefit for unit cost increase.
- (3) We need to educate urban meteorology decision makers on the information already available so we can get improvement in urban meteorology support now with little cost, and get urban meteorology on the “radar screen” of Congress and others as an important and successful area.
- (4) To compare costs in life, injury, and property damage, we need to develop standard definitions of when a death, injury, or damage is truly linked to a weather event.
- (5) We need to interface with stakeholders, define user needs and requirements for urban meteorology information, and then figure out who should provide it (public versus private debate).
- (6) The public and private sectors need to work in partnership to improve the provision of real-time weather information to users.

Panel 2: Regional Ecosystem Approaches to Urban Environmental Hazard Management

- (1) Collaboration is needed within disciplines and across disciplines. We need to identify focus areas and stakeholders. We need to define what ecosystems are and then agree on the definition of boundaries.
- (2) We need an end-to-end system approach to ecosystem management that accounts for:
 - (a) Complex physical processes that interact at multiple spatial and temporal scales, and balance many factors.
 - (b) Variability in surface morphology/land cover both within urban areas and the surrounding region.

(c) Modification of both the urban area and its surrounding area. The assumption should not be made that urban climates will always be modified in the same way (e.g., urban areas are not always heat islands; some urban areas are cooler than the surrounding area).

(3) Implementation of the Ocean Commission Report recommendations will move the U.S. toward a regional approach. A regional ecosystem approach can address a range of considerations among complex, integrated, and interdependent systems/processes.

Panel 3: Adequacy of Urban Weather Observations

(1) Current observations are inadequate to meet the needs of the users.

(2) The spatial and temporal resolution must continue to improve and new emphasis must be placed on the vertical profile.

(3) We need to work on developing observation specifications for various users' needs: their accuracy, precision, and parameter averaging time requirements.

(4) Current outreach, education, and training are inadequate to meet the needs of urban observing system developers.

(5) Communications capabilities and other public accessible technologies, such as cell phones, must be considered.

(6) Urban integrated observing networks must be designed to meet the needs of the first responders, real-time analysis, and forecast models.

(7) Current coordination and collaboration processes are ineffective. Cultural and political obstacles may be greater than technological obstacles.

Panel 4: Research and Development for Urban Weather and Climate Applications

(1) We need a better understanding of urban influences on local weather.

(2) We need more realistic urban parameterization schemes in NWP modeling systems.

(3) We need detailed databases (e.g., urban characteristics, buildings, land use, population, etc.).

(4) We need to quantify the uncertainty in model products and interpret the uncertainty for users.

(5) Urban planners should be more involved with application development.

(6) Additional urban test beds and field studies are needed to promote better understanding of urban physical processes and model improvements.

(7) We need to collect and apply field study and test bed data sets to verification and validation of models.

(8) Appropriate visualization techniques should be developed in collaboration with end users.

Panel 5: Managing Risk in the Urban Environment

(1) We need new ideas for better protection of homes and businesses.

(2) We need a first responder data system that is user friendly and that can be activated and accessed quickly, with 1 km or less resolution and 15- to 30-minute updates.

(3) We need a model for changing wind conditions.

(4) Emergency managers need accurate and timely short- and long-term weather information.

(5) Users need to understand and test weather information tools at all levels of application.

(6) Wildfire responder needs include: common technology and tools, ground-based information, and responsible homeowners.

(7) Education, training, and outreach is needed throughout urban weather application activities.

(8) We need to develop regional-scale disaster risk atlases.

(9) It is prudent to retreat from coasts for long-term safety purposes.

(10) We need better technology transfer processes.

A summary of the Forum, as well as Mr. Dumont's remarks, can be found on the OFCM web site: www.ofcm.gov.

Urban Meteorology Forum

Panel 1 Summary

Panel Name: Safety, Health, and Economic Impacts of Weather and Climate in the Urban Environment

Panel Co-Moderators: (1) Mr. Raymond J. Ban, Executive Vice-President, The Weather Channel, Inc.; and (2) Dr. John A. Dutton, Professor Emeritus of Meteorology and Dean Emeritus College of Earth and Mineral Sciences, The Pennsylvania State University

Panelists: (1) Dr. John Hayes, DOC/NOAA/NWS; (2) Dr. Josephine Malilay, DHHS/CDC; (3) Mr. Richard Carbone, NCAR; and (4) Dr. Sharon Leduc, DOC/NOAA/NESDIS

Rapporteurs: (1) Ms. Mary M. Cairns, DOC/NOAA/OFCM; and (2) Mr. Frank Estis, OFCM/STC

Guiding Questions

The questions posed below for this panel were intended as guidance for focusing the panel discussion.

- (1) What meteorological information needed by urban decision makers is not yet available? Why is it not available? For example, are there problems in getting it soon enough, problems in interpreting it for the decisions to be made, or problems of having the right kind of meteorological information (observations and/or forecasts)?
- (2) How can we make better decisions about the value of having more or better meteorological information for managing the safety, health, and economic well-being of urban communities? What do we need to know to decide on the value of information? For example, do we need to agree on measured costs and benefits of having or not having specific meteorological information before we decide what information is useful and how to provide it?
- (3) How can education, training, and outreach improve urban management and decision making with meteorological information? Can outreach to users aid in guiding R&D decisions and programs?
- (4) What actions can we take now to improve policies or systems for providing meteorological information important to the health, safety, and economic well-being of urban communities?

Synopsis

Opening Remarks

Mr. Ban opened the session by setting the stage for the panel's discussion. He stated that there are unique impacts in and on the urban environment and they are important because of the

large concentrated population in urban environments. The challenges to health, safety, and the economy are directly related to these large populations. Therefore the payoff will be substantial if we solve these challenges.

Dr. John Dutton followed Mr. Ban and outlined how the meteorological community goes through the “waterfall of observations to reduction of adverse effects.” He suggested there is a need to model the entire observation and forecast system, so we can optimize and demonstrate the cost versus benefit of developing more effective, high-value forecasts. That is, there is a need to quantitatively understand the impacts of the forecast.

Group Discussion

A wide-ranging discussion on “Safety, Health, and Economic Impacts of Weather and Climate in the Urban Environment” resulted in the following major findings or themes:

- (1) More and better collaboration/coordination is needed among and between urban officials, emergency managers, and meteorology disciplines.
- (2) Determining the benefit change with an improved forecast is important. Making this determination will lead to the best, maximum benefit per cost of forecast.
- (3) Increased forecast lead times are needed.
- (4) Education is a big key to improved urban meteorology information usage.
- (5) There is a lack of standards when it comes to linking deaths to weather events.
- (6) Discover user needs first. Then decide who should fill them.
- (7) Use the customer’s language to express risk, options, and recommendations.
- (8) When will we link real-time observations and forecasts to users no matter where they may be located? For example cars have map screens, radios listing songs playing, etc. Where is weather in doing something like this?

Consensus Reached

The panel presentations and the attendant discussion resulted in the following areas of general agreement:

- (1) Lead times for all severe weather events need to be increased and improved.
- (2) Action should be taken to look at urban meteorology from a total system approach. By taking the total system approach, we should be able to figure out a cost-to-benefit ratio showing which part or parts of the system provide the best benefit for unit cost increase.

(3) We need to educate urban meteorology decision makers on the information already available so we can (a) get improvement in urban meteorology support now with little cost and (b) and get urban meteorology on the “radar screen” of Congress and others as an important and successful area.

(4) To be able to compare costs in life, injury, and property damage, we need to develop standard definitions of when a death, injury or damage is truly linked to a weather event.

(5) Collaborate with stakeholders to define user needs and requirements for urban meteorology information, and then figure out who should provide them (the public or private sector).

(6) While no one had an answer for linking real-time weather information to users, it was felt that the public and private sectors working together as partners will determine the link and respond to it.

Unresolved Issues

There were no issues articulated during the panel discussion that seemed to end without coming to a general consensus on how the community might move forward to solve the issues presented.

Recommendations

Action items/issues developed by the panelists are listed below.

There were no **short-term action items/issues** (those which can be addressed within the next year) identified by this panel.

The **medium-term action items/issues** (those which can be addressed in 4 years or less) included:

(1) Devise a system through which the urban meteorology community can aim at improvements with large benefit-to-cost ratios and consistently describe key needs to the nation and Congressional decision makers, so the highest priority education, operational services, dissemination technologies, research and development activities, etc. will be funded.

There were no **long-term action items/issues** (those which can be addressed in 4 – 10 years) identified by this panel.

A complete summary of the Forum, as well as the presentation of each panelist and co-moderator, can be found on the OFCM web site: www.ofcm.gov.

Urban Meteorology Forum Panel 2 Summary

Panel Name: Regional Ecosystem Approaches to Urban Environmental Hazard Management

Panel Co-Moderators: (1) Dr. Douglas DeMaster, DOC/NOAA/NMFS; and (2) Dr. Laurence S. Kalkstein, Senior Research Fellow, Center for Climatic Research, University of Delaware

Panelists: (1) Mr. Leroy Spayd, DOC/NOAA/NWS Meteorological Services Division; (2) Mr. Allan Stahl, USDA/Natural Resource Conservation Service; (3) Mr. Charles B. Chestnut, U.S. Army Corps of Engineers (USACE)/Institute for Water Resources; and (4) Dr. Sue Grimmond, Indiana University/International Association for Urban Climate

Rapporteurs: (1) Mr. Jim McNitt, OFCM/STC; and (2) Lt Col Robert Rizza, DOD/USAF/OFCM

Guiding Questions

The questions posed below for this panel were intended as guidance for focusing the panel discussion.

- (1) What urban management problems need an ecosystem approach? What is different about an ecosystem approach to these problems, and why is it better? What part does meteorological information play in understanding the problems and enabling an ecosystem approach to solving them?
- (2) What are the limitations of currently available meteorological information for supporting ecosystem management approaches? What can be done to give the manager better information?
- (3) What education, training, and outreach activities could improve understanding of ecosystem management approaches and the role of meteorological and atmospheric conditions, and climate in ecosystem impacts?

Synopsis

Opening Remarks

The problems/issues that were the impetus of the workshop and that were described in the co-moderators' opening remarks included:

- (1) Communication and collaboration
- (2) Ecosystem management
- (3) Hazards mitigation and recovery actions

(4) Chain of events required for public to take action

Group Discussion

A wide-ranging discussion on “Regional Ecosystem Approaches to Urban Environmental Hazard Management” resulted in the following major findings:

- (1) Collaboration and more effective communications among stakeholders are required. For example, there is a need to define what ecosystems are first, and then agree on the definition of boundaries.
- (2) There needs to be an end-to-end system approach to ecosystem management that accounts for the:
 - (a) Complex physical processes that interact at multiple spatial and temporal scales, and balance many factors.
 - (b) Variability in surface morphology/land use both within urban areas and within a region.
 - (c) Modification of both the urban area and its surrounding area. There should not be an assumption that urban climates will always be modified in the same way (e.g., urban areas are not always heat islands; some urban areas are cooler than the surrounding area).
- (3) Implementation of the U.S. Ocean Commission recommendations will move the U.S. toward a regional approach. A regional ecosystem approach can address a range of considerations among complex, integrated, and interdependent systems/processes.

Consensus Reached

The panel presentations and the attendant discussion resulted in the following areas of general agreement:

- (1) Collaboration is needed within disciplines and across disciplines.
- (2) There is a need to identify focus areas and stakeholders.
- (3) There is a need to coordinate across both horizontal and vertical lines of communication.

Unresolved Issues

Issues that were articulated during the panel session but were not pursued further, due to time constraints, included:

- (1) Field experiments and test beds.

Recommendations

Several key action items/issues were developed by the panelists.

The **short-term action items/issues** (those which can be addressed within the next year) included:

- (1) Identify stakeholders and define “ecosystem” as it pertains to this effort.
- (2) Increase opportunities for collaboration among all communities working in hazards mitigation.
- (3) Increase education and outreach efforts (build on the Chesapeake Bay example).

The **medium-term action items/issues** (those which can be addressed in 4 years or less) included:

- (1) Generate a National effort to collect and manage land use data.
- (2) Build upon existing studies (e.g., Baltimore, MD and Phoenix, AZ). Implement long-term test beds.

The **long-term action items/issues** (those which can be addressed in 4 – 10 years) included:

- (1) Explore an expanded role for universities, including formal education tracts for urban ecosystem managers.

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Urban Meteorology Forum Panel 3 Summary

Panel Name: Adequacy of Urban Weather Observations

Panel Co-Moderators: (1) Dr. Ken Crawford, Oklahoma State Climatologist; and (2) Dr. Rayford P. Hosker, Jr., DOC/NOAA/OAR

Panelists: (1) Dr. Walter Dabberdt, Vaisala, (2) Mr. Richard Fry, DOD/DTRA; (3) Dr. Jan Dutton, AWS Weather Bug, and (4) Dr. John McGinley, DOC/NOAA/OAR

Rapporteurs: (1) Mr. Donald Carver, OFCM/DOT; and (2) Mr. Tony Ramirez, OFCM/STC

Guiding Questions

The questions posed below for this panel were intended as guidance for focusing the panel discussion.

(1) What are the requirements for timeliness, accuracy, and precision for urban applications of meteorological information (public health and safety; business and community planning and management; emergency planning, response, and recovery; transportation systems management; and power and communications vulnerability to solar eruptions)? Do current observing systems meet these requirements?

(2) Where current observing systems do not meet urban requirements; of these, which needs have the highest priority?

(3) What are the major challenges in collecting, processing, assimilating and communicating urban weather observations to meet urban users' requirements?

(4) Are the education, training and outreach challenges related to weather observations being addressed?

Synopsis

Opening Remarks

Dr. Hosker opened the session by emphasizing that the collection and dissemination of weather data in urban areas face unique challenges. Among these challenges are complexities of terrain. He pointed out that science issues such as the inadequate resolution of spatial scales and the representativeness of observations continue to be major concerns. Non-science issues such as funding for measurement networks and problems in siting sensors continue to constrain improvement efforts. He outlined the needs for improvement in urban weather observations and related these needs to each of the forum's five focus areas: (1) the need for more observations to detect and monitor severe weather; (2) special integrated networks, vertical data, and coupling

for homeland security; (3) enhanced networks and vertical sensors for air quality data; (4) the use of radar observations to supplement precipitation measurements for water quality data; (5) the need for a firm commitment to quality observations in monitoring climate changes.

Dr. Crawford presented an opening perspective based on his experiences with the Oklahoma Mesonet. He stressed that timeliness, such as the collection of short-term average intervals, and the accuracy of all measured parameters are important areas that must continue to improve. He further related that the proper siting of urban networks is the most critical issue in design and implementation. He went on to say that when dealing with collecting, processing, assimilating, and communicating data and products, we must be sure to be responsive to the needs of the users, particularly first responders. Dr. Crawford went on to point out that there aren't enough formal education and training programs to meet the needs of urban users.

Discussion

A wide-ranging discussion on "Adequacy of Urban Weather Observations" resulted in the following major findings:

- (1) There is a lack of funding for urban observing network programs.
- (2) The challenges and criticality in properly siting observing networks needs to be addressed
- (3) There is a need for improved accuracy and precision in the data.
- (4) Quality assurance as well as the resolution of data and products needs to be addressed.
- (5) There is a lack of availability of data in the public domain.
- (6) Outreach, education, and training programs for both users and providers are significant shortfalls.
- (7) The process for the design of urban observing networks should include the use of test beds. These test beds should also be routinely used to assist in the efficient transition of the research to operations.
- (8) Public, private, and academic partnerships are an effective means for improving collaboration and cooperation in research and development among all stakeholders, particularly with regard to funding and cost sharing opportunities.
- (9) Vertical resolution of weather parameters and data in urban and surrounding areas are needed for both users and providers. Doppler radars, lidars, and wind profilers are currently being used to address vertical resolution and the specific needs of atmospheric transport and diffusion modelers.

Two specific capabilities were also briefed to the group during this session: (1) the data capabilities of the AWS Weatherbug and (2) the ongoing microscale meteorological measurements conducted at the space centers.

Consensus Reached

The panel presentations and the attendant discussion resulted in the following areas of general agreement:

- (1) Meteorological observations of today are inadequate to meet the growing and diverse needs of the users and providers of weather information in the urban environment. The siting of observational sensors is possibly the most critical step in the design and implementation of urban networks. Poor siting will inevitably result in unrepresentative data and therefore degraded information and products for the users. These data and informational products must meet the needs of on-site users and the models. The measurement networks must measure both the boundary layer flow and the more turbulent flow within elements of the urban environment.
- (2) The spatial and temporal resolution of observations must continue to improve, and new emphasis must be placed on the collection of data in the vertical.
- (3) Much work is needed on understanding and developing specifications for various users' observations needs in terms of accuracy thresholds, precision thresholds, and collection of short-term averages in smaller time intervals.
- (4) Current outreach, education and training programs are either not available or inadequate to meet the needs of urban observing system developers. Specifically, there is not enough training available in the growing field of urban observing system engineering. It is also important that the developers of these new systems respond to the specific needs of urban users.
- (5) Communications capabilities other than publicly accessible technologies such as cell phones must be considered when developing information receipt and dissemination strategies. Under crisis situations, the cell system, for example, will likely become saturated, thereby interrupting the transmission and receipt of critical data.
- (6) Urban integrated observing networks must be designed to meet the needs of the first responders. In this regard, first responders have a critical reliance on the real-time analysis of current weather parameters and the output of the forecast models.
- (7) Current coordination and collaboration processes among members of the Urban Meteorological user and provider communities are either ineffective or non-existent. In addition, public/private/academic partnerships are weak. Cultural obstacles may be greater than technological obstacles.

Recommendations

Several key action items/issues were developed by the panelists.

The **short-term action items/issues** (those which can be addressed within the next year) included:

- (1) Develop more effective partnerships within public/private/academia sectors.
- (2) Develop methods to design urban observing networks and guide instrumentation siting.
- (3) Develop test-beds with user input to assist in design and the transition of research to operations.
- (4) Conduct urban experiments on existing networks and consider the following:
 - (a) Merging to GIS databases.
 - (b) Analyzing results to adjust measurements siting.
 - (c) Developing and implementing tailored products for users.

The **medium-long term action items/issues** (those which can be addressed in 4 years to 10 years) included:

- (1) Develop and implement outreach, education, and training programs to meet the needs of urban observing system engineers and users.
- (2) Collect short-term averages at intervals less than 5 minutes by 2010, and 1- to 2-minute interval observations after 2010 to be made available to the public within 1 or 2 minutes of collection.
- (3) Bring current Doppler radar and Doppler lidar technologies to operational use for atmospheric transport and diffusion and other applications.
- (4) Develop reliable communication technologies for data acquisition and dissemination.
- (5) Set up experimental networks for one or more urban areas.
- (6) Deploy specifically designed network systems for certain unique urban areas.

There were no **long-term action items/issues** (those which can be addressed in 4 – 10 years) identified by this panel.

A complete summary of the Forum, as well as the presentation of each panelist and co-moderator, can be found on the OFCM web site: www.ofcm.gov.

Urban Meteorology Forum

Panel 4 Summary

Panel Name: Research and Development for Urban Weather and Climate Applications

Panel Co-Moderators: (1) Dr. Alexander MacDonald, DOC/NOAA/OAR; and (2) Dr. J. Marshall Shepherd, NASA/Goddard Space Flight Center

Panelists: (1) Dr. Robert Bornstein, San Jose State University; (2) Dr. Lloyd A Treinish, IBM, Thomas J. Watson Research Center; (3) Mr. John Pace, DOD/DTRA; and (4) Mr. David Williams, EPA/Office of Research and Development/Environmental Sciences Division

Rapporteurs: (1) CDR Stephanie Hamilton, DOD/DTRA; and (2) Mr. John Hannan, DTRA/NGC

Guiding Questions

The questions posed below for this panel were intended as guidance for focusing the panel discussion.

- (1) What meteorological information is needed by—but not yet available to—urban decision makers which cannot be provided without research and development? What information needs could be better met through additional research and development? How long will it take to meet those needs?
- (2) What current R&D activities have the greatest potential to improve the meteorological information useful to urban decision makers? How long will it take to produce the improvements?
- (3) Based on the answers to questions 1 and 2, which R&D areas for meteorological information require more attention, higher priority, or more resources?
- (4) Are there R&D results/products that are ready for transfer into urban applications now? Which needs for urban meteorological information will emerging R&D results address?
- (5) How well are current R&D collaborations and partnerships working in meeting urban needs for meteorological information? Where are more collaboration and partnering needed or useful?
- (6) Are the current R&D transfer processes effective in supporting urban applications? How could they be improved? Are existing test beds and other testing facilities adequate for transferring technology to urban applications?

Synopsis

Opening Remarks

The co-moderators welcomed the forum participants and in the interest of time moved immediately to presentations.

Group Discussion

A wide-ranging discussion on “Research and Development for Urban Weather and Climate Applications” resulted in the following major findings or themes:

- (1) There is a need for automated notification systems that allow for the orderly evacuation of city populations.
- (2) The deficiency of current urban parameterization schemes and databases needs to be addressed.
- (3) Developing partnerships to utilize research knowledge, observations and applications is needed.
- (4) End users are not sufficiently involved with science and technology development process.
- (5) Sensor data fusion development is essential for addressing urban meteorology challenges.
- (6) The increased use of remotely sensed meteorological data in numerical models is needed.
- (7) Collaboration between federal and civil organization including more efficient transfer of technologies is needed.

Consensus Reached

The panel presentations and the attendant discussion resulted in the following areas of general agreement:

- (1) There is a need for better understanding of urban influences on local weather
- (2) More realistic urban parameterization schemes in numerical weather prediction modeling systems are needed.
- (3) There is a need for detailed databases (e.g., urban characteristics, buildings, land use, population, etc.).
- (4) Urban planners should be more involved with application development.
- (5) Additional urban test beds and field studies are needed to promote better understanding of urban physical processes and subsequent model improvements.

(6) There is a need to collect and apply field study and test bed data sets to verification and validation of models

(7) Appropriate visualization techniques should be developed in collaboration with end users.

Unresolved Issues

There were no issues articulated during the panel discussion that seemed to end without coming to a general consensus on how the community might move forward to solve the issues presented.

Recommendations

Several key action items/issues were developed by the panelists.

The **short-term action items/issues** (those which can be addressed within the next year) included:

(1) Finish Landscan USA database development (EPA).

(2) Integrate advanced satellite and ground-based observations into numerical weather prediction systems (NASA).

The **medium-term action items/issues** (those which can be addressed in 4 years or less) included:

(1) Develop sensor systems and associated fusion techniques (DOD).

(2) Develop new geosynchronous perspectives on urban and dispersion issues (DOD, NASA, NOAA).

There were no **long-term action items/issues** (those which can be addressed in 4 – 10 years) identified by this panel.

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Urban Meteorology Forum

Panel 5 Summary

Panel Name: Managing Risk in the Urban Environment

Panel Co-Moderators: (1) Ms. Margaret Davidson, DOC/NOAA/NOS; and (2) Mr. Harvey Ryland, President and CEO, Institute for Business and Home Safety

Panelists: (1) Mr. Ranger Dorn, Battalion Chief, Ventura Co. Fire Department; (2) Mr. John Gambel, DHS/FEMA; and (3) Ms. Janet Anderson, USDA/ Forest Service/Fire and Aviation Management

Rapporteurs: (1) Mr. Floyd Hauth, OFCM/STC

Guiding Questions

The questions posed below for this panel were intended as guidance for focusing the panel discussion.

(1) In each of the forum's five focus areas, what are the hazards to which meteorological information applies? What information is needed to manage the risks from those hazards? Is the information available?

(2) What are the similarities and differences in information needed to manage risk by different categories of users, such as:

- (a) Emergency response managers (including planners and responders)
- (b) Business/enterprise managers
- (c) Information media and other information providers?

(3) What education, training, and outreach activities should be part of risk communication and risk management in the five focus areas?

(4) What planning techniques or risk management practices have proven to be most useful in responding to hazards in the five focus areas, such as urban weather disasters or air and water quality hazards? What improvements in meteorological information would support these practices?

(5) Are we effectively transferring R&D results to applications to meet the needs of urban risk managers?

Synopsis

Opening Remarks

Mr. Harvey Ryland welcomed the co-moderator, Margaret Davidson, panel members, and the forum participants. He challenged the audience to come with “wild ideas” to help reduce risks for homes and businesses. He noted that such ideas were needed to help develop a new level of protection for homes and business. He provided examples of construction deficiencies and made a case for strong building codes and their enforcement to help make communities more disaster resistant. Mr. Ryland also noted the publication of a pamphlet entitled "How to Recover." This pamphlet provides guidance to the public.

Group Discussion

A wide-ranging discussion on “Managing Risk in the Urban Environment” resulted in the following major findings or themes:

- (1) There is a need for a new level of protection for homes and businesses.
- (2) There is a need for information (guidance) pamphlets useful for public.
- (3) First responders and emergency managers do not have adequate tools/information.
- (4) There are continued problems in managing risks (rebuilding in areas with repeated disasters).
- (5) The big challenge is how to manage all the groups that have a stake in disaster response.
- (6) Wildland fires are a challenging and growing problem (health effects, cost of losses increasing, forest fuels accumulating, urban/rural blending issues).
- (7) Education, training and outreach is a problem across urban activities.
- (8) Risk communication is a challenge. How do we get people to listen?
- (9) Interaction with the media is very important.
- (10) There are benefits to be gained with integrated planning.
- (11) There are deficiencies in ways to transfer technology to users/operators.
- (12) Consider the use of incentives and disincentives for disaster resistance actions is important.
- (13) It is increasingly difficult to convince people to evacuate for hurricanes.

Consensus Reached

The panel presentations and the attendant discussion resulted in the following areas of general agreement:

- (1) There is a need for new ideas for better protection of homes and businesses.
- (2) A first responder data system that is user friendly, can be activated and accessed quickly, with 1 km or less resolution and 15 to 30 minute updates is essential to addressing the challenges of the urban environment.
- (3) A model for changing wind conditions is needed.
- (4) Emergency managers need accurate and timely short and long term weather information.
- (5) Users need to understand and test weather information tools at all levels of application.
- (6) Wildfire responder needs include (but are not limited to): common technology and tools, ground-based information, responsible homeowners.
- (7) Education, training, and outreach are needed throughout urban weather application activities.
- (8) There is a need to develop regional scale disaster risk atlases.
- (9) It is prudent to retreat from coasts for long term safety purposes.
- (10) There is a need for better technology transfer processes.

Unresolved Issues

There were no issues articulated during the panel discussion that seemed to end without coming to a general consensus on how the community might move forward to solve the issues presented.

Recommendations

Several key action items/issues were developed by the panelists.

The **short-term action items/issues** (those which can be addressed within the next year) with the office of primary responsibility identified by this panel included:

- (1) Develop a user-friendly first responder data system that can be activated quickly, accessed and updated easily (NOAA, FEMA).
- (2) Test and use appropriate decision support tools at all levels of emergence response (FEMA).
- (3) Develop regional scale disaster risk atlases (FEMA, NOAA).

- (4) Provide more training for diverse groups of first responders and emergency personnel.
- (5) Develop accurate, timely and consistent data and promote the use of common technology and tools for wildland fire responders (NOAA, USDA).

The **medium-term action items/issues** (those which can be addressed in 4 years or less) with the office(s) of primary responsibility included:

- (1) Develop a new level of protection for homes and businesses (IBHS, FEMA).
- (2) Improve technology transfer processes for disaster applications (NOAA, FEMA).

There were no **long-term action items/issues** (those which can be addressed in 4 – 10 years) identified by this panel.

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